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1: AY207429. Homo sapiens inte...[gi:27501935]

Links

LOCUS AY207429 9803 bp DNA linear PRI 05-JAN-2003

DEFINITION Homo sapiens interleukin 11 (IL11) gene, complete cds.

ACCESSION AY207429

VERSION AY207429.1 GI:27501935

KEYWORDS .

SOURCE Homo sapiens (human)

ORGANISM Homo sapiens
Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Euteleostomi; Mammalia; Eutheria; Primates; Catarrhini; Hominidae; Homo.

REFERENCE 1 (bases 1 to 9803)

AUTHORS Rieder,M.J., Carrington,D.P., da Ponte,S.H., Hastings,N.C., Ahearn,M.O., Kuldane,S.A., Rajkumar,N., Toth,E.J., Yi,Q. and Nickerson,D.A.

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FEATURES Location/Qualifiers

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/db_xref="taxon:9606"

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variation 187
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variation 447
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FIGURE 1

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FIGURE 1

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	/replace="g"
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<u>variation</u>	5970
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FIGURE 1

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<u>variation</u>	7161 /gene="IL11" /frequency="0.07" /replace="a"
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FIGURE 1

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FIGURE 1

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SEQ ID NO:73:

BASE COUNT 2004 a 3117 c 2797 g 1885 t

ORIGIN

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FIGURE 1

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FIGURE 1

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8941 gtgggtccct gttctggggg agctgcaaaa gaccctccag aagggcgagt acctgccct
9001 ccgtccgctg ccatgttctg agagtaactt tgttcaggto tccagttccc agtgccccgg
9061 ggctgagagg gacagagggg aagcaaggcc ccccggtgtg ggggatcttg agagggaacg
9121 ggatttagca gtcactgtgt gggggacgat caggagggag gctcaggctg tggctgtgg
9181 aggaaggagt ggtcccagcc cctctccct ggctgcccc ggtgacctat caagggggcc
9241 cagtgttcgt gaatcacaga accaaocggc tggccatggg cgtggcgccc tccctgccag
9301 gcctggtgtt gcctgacatc ttgctgatcg gccagcccg caggagacag gactgtccg
9361 gcctcgtgct gaccaggtgc cgcaccccc aaccctcctg ccgccccct caccctcct
9421 gctctagacg ctccccctc cctctcccag gatgatcccc ctggacctg tccacctctg
9481 cgtccatgac ctctctgcct gggcctgaa gctgcgcctg gtctcgggccc gccagtacta
9541 catggccctg gacgcccctg acaacgaggt gggcttccctg ttccactgct gggctccgct
9601 catcaacctg cttcaggagc cggctccac ctggaccccc aggccacgc cagcgcccc
9661 cctggatatg ccgctggcca aagcgctgc ctccacctgg cacctgcagg tgggatccca
9721 gctccacaga ccagggcag gcaggcccca ggaacctccc ggccagatcc agaggggact
9781 cgaccaagag cccaaagtct agg

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FIGURE 1

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Complete native human IL-11 -SEQ ID NO:1-:

1	11	21	31	41	51	
1	MNCVCRLVLV	VLSLWPD	TAV	APGPPG	PPR	VSPDPRAELD
						STVLLTRSL
						ADTRQLAAQL
61	RDKEFPADGDH	NLDSLPTLAM	SAGALGALQL	PGVLT	RLRAD	LLSYLRHVQW
						LRRAGGSSLK
121	TLEPELGT	LQ	ARLDRLRL	QLLMSRLALP	QPPDPPAPP	LAPPSSAWGG
						IRAAHAILGG
181	LHLLTLDWAVR	GLLLK	TRL			

Complete native macaque IL-11 (Macaca fascicularis) -SEQ ID NO:2- :

1	11	21	31	41	51	
1	MNCVCRLVLV	VLSLWPD	TAV	APGPPG	SPR	ASPDRAELD
						STVLLTRSL
						EDTRQLTIQL
61	KDKFPADGDH	NLDSLPTLAM	SAGALGALQL	PSVLT	RLRAD	LLSYLRHVQW
						LRRAGGSSLK
121	TLEPELGT	LQ	TRLDRLRL	QLLMSRLALP	QLPDPAPP	LAPPSSWGG
						IRAAHAILGG
181	LHLLTLDWAVR	GLLLK	TRL			

Complete native mouse IL-11 (Mus musculus) -SEQ ID NO:3- :

1	11	21	31	41	51	
1	MNCVCRLVLV	VLSLWPD	RVV	APGPPG	SPR	VSSDPRADLD
						SAVLLTRSL
						ADTRQLAAQM
61	RDKEFPADGDH	NLDSLPTLAM	SAGTLGSLQL	PGVLT	RLRVD	LMSYLRHVQW
						LRRAGGSSLK
121	TLEPELGT	LQ	ARLERLLRL	QLLMSRLALP	QAAPDQVIP	LGPPASAWGS
						IRAAHAILGG
181	LHLLTLDWAVR	GLLLK	TRL			

Complete native rat IL-11 (Rattus norvegicus) -SEQ ID NO:4- :

1	11	21	31	41	51	
1	MNCVCRLVLV	VLSLWPD	RVV	APGPPG	SPR	VSSDPRADLD
						SAVLLTRSL
						ADTRQLAAQM
61	RDKEFPADGDH	NLDSLPTLAM	SAGTLGSLQL	PGVLT	RLRVD	LMSYFRHVQW
						LRRAGGSSLK
121	TLEPELGT	LQ	ARLERLLRL	QLLMSRLALP	QAAPDQPAVP	LGPPASAWGS
						IRAAHAILGG
181	LHLLTLDWAVR	GLLLK	TRL			

FIGURE 2

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Native human IL-11 deleted from the 34 first aminoacids -SEQ ID NO :5-:

PRAELD STVLLTRSLL ADTRQLAAQL RDKFPADGDH NLDSLPTLAM
SAGALGALQL PGVLTRLRAD LLSYLRHVQW LRRAGGSSLK TLEPELGTQ
ARLDRLRLRL QLLMSRLALP QPPDPPAPP LAPPSSAWGG IRAAHAILGG
LHLTLDDWAVR GLLLLKTRL

Native macaque IL-11 deleted from the 34 first aminoacids -SEQ ID NO:6- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQ
TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSWGG IRAAHAILGG
LHLTLDDWAVR GLLLLKTRL

Native mouse IL-11 deleted from the 34 first aminoacids -SEQ ID NO:7- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
ARLERLLRLRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
LHLTLDDWAVR GLLLLKTRL

Native rat IL-11 deleted from the 34 first aminoacids -SEQ ID NO:8- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGGPSLK TLEPELGALQ
ARLERLLRLRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
LHLTLDDWAVR GLLLLKTRL

FIGURE 3

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hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :9-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGTQARLDRLRLRL
QLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLX₁LTLY₂WAVRGLL
LKTRL wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :10-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGTQARLDRLRLRL
QLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLVLTLYWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :11-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGTQARLDRLRLRL
QLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLALTLYWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :12-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGTQARLDRLRLRL
QLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLVLTLYWAVRGLLL
LKTRL

hIL-11 mutein deriving from 34aa-deleted native human hIL-11 -SEQ ID NO :13-:

PRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDLPTLAMSAGALGA
LQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGTQARLDRLRLRL
QLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLALTLYWAVRGLLL
LKTRL

FIGURE 4

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hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :14-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGT
LQARLDRLRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLX₁
LTLX₂WAVRGLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :15-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGT
LQARLDRLRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLYL
TLAWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :16-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGT
LQARLDRLRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLAL
TLYWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :17-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGT
LQARLDRLRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLYL
TLYWAVRGLLLLKTRL

hIL-11 mutein deriving from 21aa-deleted native human hIL-11 -SEQ ID NO :18-:

PGPPPGPPRVSPDPRAELDSTVLLTRSLLADTRQLAAQLRDKFPADGDHNLDL
PTLAMSAGALGALQLPGVLTRLRADLLSYLRHVQWLRRAAGGSSLKTLEPELGT
LQARLDRLRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRAAHAILGGLAL
TLAWAVRGLLLLKTRL

FIGURE 5

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hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :19-:

MNCVCRLVLVVLSLWPD~~T~~AVAPGPPPGPPRVSPDPRAELDSTVLLTRSL~~L~~ADTR
 QLAAQLRDKFPADGDHNLD~~S~~LPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
 VQWLRRAGGSS~~L~~KTLEPELGT~~L~~QARLDRLRLRLQLLMSRLALPQPPDP~~P~~PAPPL
 APPSSAWGGIRAAHAILGGL~~X~~₁LT~~L~~~~X~~₂WAVRG~~L~~LL~~L~~LKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :20-:

MNCVCRLVLVVLSLWPD~~T~~AVAPGPPPGPPRVSPDPRAELDSTVLLTRSL~~L~~ADTR
 QLAAQLRDKFPADGDHNLD~~S~~LPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
 VQWLRRAGGSS~~L~~KTLEPELGT~~L~~QARLDRLRLRLQLLMSRLALPQPPDP~~P~~PAPPL
 APPSSAWGGIRAAHAILGGL~~V~~LT~~L~~~~A~~WAVRG~~L~~LL~~L~~LKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :21-:

MNCVCRLVLVVLSLWPD~~T~~AVAPGPPPGPPRVSPDPRAELDSTVLLTRSL~~L~~ADTR
 QLAAQLRDKFPADGDHNLD~~S~~LPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
 VQWLRRAGGSS~~L~~KTLEPELGT~~L~~QARLDRLRLRLQLLMSRLALPQPPDP~~P~~PAPPL
 APPSSAWGGIRAAHAILGGL~~A~~LT~~L~~~~Y~~WAVRG~~L~~LL~~L~~LKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :22-:

MNCVCRLVLVVLSLWPD~~T~~AVAPGPPPGPPRVSPDPRAELDSTVLLTRSL~~L~~ADTR
 QLAAQLRDKFPADGDHNLD~~S~~LPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
 VQWLRRAGGSS~~L~~KTLEPELGT~~L~~QARLDRLRLRLQLLMSRLALPQPPDP~~P~~PAPPL
 APPSSAWGGIRAAHAILGGL~~V~~LT~~L~~~~Y~~WAVRG~~L~~LL~~L~~LKTRL

hIL-11 mutein deriving from complete native human hIL-11 -SEQ ID NO :23-:

MNCVCRLVLVVLSLWPD~~T~~AVAPGPPPGPPRVSPDPRAELDSTVLLTRSL~~L~~ADTR
 QLAAQLRDKFPADGDHNLD~~S~~LPTLAMSAGALGALQLPGVLTRLRADLLSYLRH
 VQWLRRAGGSS~~L~~KTLEPELGT~~L~~QARLDRLRLRLQLLMSRLALPQPPDP~~P~~PAPPL
 APPSSAWGGIRAAHAILGGL~~A~~LT~~L~~~~A~~WAVRG~~L~~LL~~L~~LKTRL

FIGURE 6

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IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:24- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
 SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQLQ
 TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG
 IRAAHAILGG LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:25- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
 SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQLQ
 TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG
 IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:26- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
 SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQLQ
 TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG
 IRAAHAILGG LALTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:27- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
 SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQLQ
 TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG
 IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native macaque IL-11 -SEQ ID NO:28- :

PRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH NLDSLPTLAM
 SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK TLEPELGTQLQ
 TRLDRLRLRL QLLMSRLALP QLPPDPPAPP LAPPSSTWGG
 IRAAHAILGG LALTLYWAVR GLLLLKTRL

FIGURE 7

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IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:29- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH
 NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK
 TLEPELGTQ TRLDRLRLRL QLLMSRLALP QLPPDPPAPP
 LAPPSSTWGG IRAAHAILGG LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:30- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH
 NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK
 TLEPELGTQ TRLDRLRLRL QLLMSRLALP QLPPDPPAPP
 LAPPSSTWGG IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:31- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH
 NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK
 TLEPELGTQ TRLDRLRLRL QLLMSRLALP QLPPDPPAPP
 LAPPSSTWGG IRAAHAILGG L_ALTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:32- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH
 NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK
 TLEPELGTQ TRLDRLRLRL QLLMSRLALP QLPPDPPAPP
 LAPPSSTWGG IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native macaque IL-11 -SEQ ID NO:33- :

PGPPPGSPR ASPDPRAELD STVLLTRSLL EDTRQLTIQL KDKFPADGDH
 NLDSLPTLAM SAGALGALQL PSVLTRLRAD LLSYLRHVQW LRRAMGSSLK
 TLEPELGTQ TRLDRLRLRL QLLMSRLALP QLPPDPPAPP
 LAPPSSTWGG IRAAHAILGG L_ALTLYWAVR GLLLLKTRL

FIGURE 8

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IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:34- :

MNCVCRLVLV VLSLWPD~~T~~A~~V~~ APGPPPGSPR ASPDPRAELD STVLLTRSL~~L~~
 EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD
 LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLRLRL QLLMSRLALP
 QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L~~X~~₁LT~~L~~₂WAVR
 GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:35- :

MNCVCRLVLV VLSLWPD~~T~~A~~V~~ APGPPPGSPR ASPDPRAELD STVLLTRSL~~L~~
 EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD
 LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLRLRL QLLMSRLALP
 QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L~~Y~~LT~~L~~AWAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:36- :

MNCVCRLVLV VLSLWPD~~T~~A~~V~~ APGPPPGSPR ASPDPRAELD STVLLTRSL~~L~~
 EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD
 LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLRLRL QLLMSRLALP
 QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L~~A~~LT~~L~~YWAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:37- :

MNCVCRLVLV VLSLWPD~~T~~A~~V~~ APGPPPGSPR ASPDPRAELD STVLLTRSL~~L~~
 EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD
 LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLRLRL QLLMSRLALP
 QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L~~Y~~LT~~L~~YWAVR GLLLLKTRL

IL-11 mutein deriving from complete native macaque IL-11 -SEQ ID NO:38- :

MNCVCRLVLV VLSLWPD~~T~~A~~V~~ APGPPPGSPR ASPDPRAELD STVLLTRSL~~L~~
 EDTRQLTIQL KDKFPADGDH NLDSLPTLAM SAGALGALQL PSVLTRLRAD
 LLSYLRHVQW LRRAMGSSLK TLEPELGTLQ TRLDRLRLRL QLLMSRLALP
 QLPPDPPAPP LAPPSSTWGG IRAAHAILGG L~~A~~LT~~L~~AWAVR GLLLLKTRL

FIGURE 9

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IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:39- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
 LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:40- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
 LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:41- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
 LALTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:42- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
 LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native mouse IL-11 -SEQ ID NO:43- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH SLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS IRAAHAILGG
 LALTLYWAVR GLLLLKTRL

FIGURE 10

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IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:44- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS
 IRAAHAILGG LX₁LTLX₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:45- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS
 IRAAHAILGG LYLT~~L~~AWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:46- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS
 IRAAHAILGG L~~A~~LTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:47- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS
 IRAAHAILGG LYLTLY~~W~~AVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native mouse IL-11 -SEQ ID NO:48- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYLRHVQW LRRAGGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPVIP LGPPASAWGS
 IRAAHAILGG L~~A~~LT~~L~~AWAVR GLLLLKTRL

FIGURE 11

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IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:49- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPVIP LGPPASAWGS IRAAHAILGG LX₁LTLX₂WAVR
 GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:50- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPVIP LGPPASAWGS IRAAHAILGG LYLTLAWVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:51- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLYWAVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:52- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPVIP LGPPASAWGS IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from complete native mouse IL-11 -SEQ ID NO:53- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH SLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYLRHVQW LRRAGGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPVIP LGPPASAWGS IRAAHAILGG LALTLAWVR
 GLLLLKTRL

FIGURE 12

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IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:54- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
 LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:55- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
 LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:56- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
 LALTYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:57- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
 LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 34aa-deleted native rat IL-11 -SEQ ID NO:58- :

PRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH NLDSLPTLAM
 SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAGPSLK TLEPELGALQ
 ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS IRAAHAILGG
 LALTYWAVR GLLLLKTRL

FIGURE 13

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IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:59- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS
 IRAAHAILGG LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:60- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS
 IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:61- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS
 IRAAHAILGG LALTYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:62- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS
 IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from 21aa-deleted native rat IL-11 -SEQ ID NO:63- :

PGPPAGSPR VSSDPRADLD SAVLLTRSLL ADTRQLAAQM RDKFPADGDH
 NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD LMSYFRHVQW LRRAAGPSLK
 TLEPELGALQ ARLERLLRRL QLLMSRLALP QAAPDQPAVP LGPPASAWGS
 IRAAHAILGG LALTYWAVR GLLLLKTRL

FIGURE 14

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IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:64- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYFRHVQW LRRAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPAVP LGPPASAWGS IRAAHAILGG LX₁LTLY₂WAVR GLLLLKTRL

wherein X₁ and X₂ are chosen from the group comprising :

- Alanine (A),
- Valine (V),
- Leucine (L),
- Isoleucine (I),
- Phenylalanine (F),
- Methionine (M),
- Proline (P),
- Tryptophan (W).

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:65- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYFRHVQW LRRAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPAVP LGPPASAWGS IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:66- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYFRHVQW LRRAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLYWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:67- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYFRHVQW LRRAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPAVP LGPPASAWGS IRAAHAILGG LYLTLYWAVR GLLLLKTRL

IL-11 mutein deriving from complete native rat IL-11 -SEQ ID NO:68- :

MNCVCRLVLV VLSLWPDRVV APGPPAGSPR VSSDPRADLD SAVLLTRSLL
 ADTRQLAAQM RDKFPADGDH NLDSLPTLAM SAGTLGSLQL PGVLTRLRVD
 LMSYFRHVQW LRRAGPSLK TLEPELGALQ ARLERLLRRL QLLMSRLALP
 QAAPDQPAVP LGPPASAWGS IRAAHAILGG LALTLYWAVR GLLLLKTRL

FIGURE 15

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Joined CDS for human complete native IL-11 –SEQ ID NO:69-:

atg aac tgt gtt tgc cgc ctg gtc ctg gtc gtg ctg agc ctg tgg cca gat aca gct gtc gcc cct ggg cca cca
 cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc
 ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat
 tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg
 ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag
 acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg
 tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg
 ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg cac ctg aca ctt gac tgg gcc gtg agg gga
 ctg ctg ctg ctg aag act cgg ctg tga

**Joined CDS for the IL-11 mutein which derives from the 34aa-deleted human IL-11 –
SEQ ID NO:70-:**

cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca
 cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg
 ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg
 cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag
 gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg
 gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc
 ctg ggg ggg ctg n₁n₂n₃ ctg aca ctt n₄n₅n₆ tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg
 tga

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are both chosen among the group comprising the nucleotide codons which codes for a hydrophobic aminoacid, namely for Alanine (A), Valine (V), Leucine (L), Isoleucine (I), Phenylalanine (F), Methionine (M), Proline (P), Tryptophan (W).

$n_1n_2n_3$ and $n_4n_5n_6$ can be chosen among the group comprising the following nucleotide codons:

- GCT, GCC, GCA, GCG
- GTT, GTC, GTA, GTG,
- TTA, TTG, CTT, CTC, CTA, CTG,
- ATT, ATC, ATA,
- TTT, TTC,
- ATG,
- CCT, CCC, CCA, CCG,
- TGG.

FIGURE 16A

Joined CDS for the IL-11 mutein which derives from the 21aa-deleted human IL-11 – SEQ ID NO:71-:

cct ggg cca cca cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg
acc cgc tct ctc ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac
cac aac ctg gat tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg
ctg aca agg ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc
tct tcc ctg aag acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg
cag ctc ctg atg tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc
ccc tcc tca gcc tgg ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg n₁n₂n₃ ctg aca ctt
n₄n₅n₆ tgg gcc gtg agg gga ctg ctg ctg ctg aag act cgg ctg tga

wherein the codon n₁n₂n₃ and the codon n₄n₅n₆ are as defined in Figure 16A.

Joined CDS for the IL-11 mutein which derives from the complete human IL-11 –SEQ ID NO:72-:

atg aac tgt gtt tgc cgc ctg gtc ctg gtc gtg ctg agc ctg tgg cca gat aca gct gtc gcc cct ggg cca cca
cct ggc ccc cct cga gtt tcc cca gac cct cgg gcc gag ctg gac agc acc gtg ctc ctg acc cgc tct ctc
ctg gcg gac acg cgg cag ctg gct gca cag ctg agg gac aaa ttc cca gct gac ggg gac cac aac ctg gat
tcc ctg ccc acc ctg gcc atg agt gcg ggg gca ctg gga gct cta cag ctc cca ggt gtg ctg aca agg
ctg cga gcg gac cta ctg tcc tac ctg cgg cac gtg cag tgg ctg cgc cgg gca ggt ggc tct tcc ctg aag
acc ctg gag ccc gag ctg ggc acc ctg cag gcc cga ctg gac cgg ctg ctg cgc cgg ctg cag ctc ctg atg
tcc cgc ctg gcc ctg ccc cag cca ccc ccg gac ccg ccg gcg ccc ccg ctg gcg ccc ccc tcc tca gcc tgg
ggg ggc atc agg gcc gcc cac gcc atc ctg ggg ggg ctg n₁n₂n₃ ctg aca ctt n₄n₅n₆ tgg gcc gtg agg
gga ctg ctg ctg ctg aag act cgg ctg tga

wherein the codon n₁n₂n₃ and the codon n₄n₅n₆ are as defined in Figure 16A.

FIGURE 16B

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Mutated AY207429 nucleic acid -SEQ ID NO:74-:

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1  acacctgtat  tcccaccact  ttgggaggct  gaggcgggag  gatgacctga  gctcaggagt
61  ttgagaccag  cctgggcaac  atggcaaaac  cctatctcta  ctaaaaatac  aaaaaatagc
121  caggcatggt  ggcggtgccc  tgtaatccca  gctactcagg  aggctgaggc  atgagaatca
181  cttgaacctg  ggaggcggag  gttacagtga  gctgagatca  caccactgca  ccccagcctg
241  ggtgacacag  cgagactctg  tctcaaaaaa  accaaaaacg  aggccaggca  cggtagctca
301  cacctgtcat  cccagcactt  tgggaggcgg  aggcaggcgg  atcacgaagt  caggagtctg
361  agaccagcct  ggccaacatg  gtaagacccc  gtctctacta  aaaatacaaa  attagccggg
421  tgtggtggcg  cacacctgta  atcccagcta  cttgggaggc  tgaggcagga  gaatcgcttg
481  aaccggggag  gtggagggtg  cagtgaagctg  agattgtgcc  attgatcgcg  ccattgcaact
541  ccagcctggg  tgacagagtg  agactcagta  ccaaaaaaca  aacaaacaaa  aaacaaacaa
601  aaaatgagaa  aggcttttac  tctctgcccc  cattgctgag  tccccaacat  ctcagcgtct
661  ctgtctttct  aatatctctg  tctccccctt  tctgtccctg  gggcctctcc  gtccctgtca
721  ctctgccccg  tgtctctggt  tgccctgggc  ctttcttcag  ctgcggcctc  ctctgtctca
781  gagtcttggt  gtctctgttc  ctttccccct  ggggtctccc  tgggtctccc  caagtccctc
841  ctgctgtctt  cctcccgtct  tctgatctct  gactcccaga  acctctccct  ctgtctccag
901  ggctgccccct  ctgatcctct  ttgcttctct  ggtgtgtctc  tctggctgcc  tccatctctg
961  tggatctccg  tctccctgtc  tctgtctcag  tctgtccttc  actctgtgtg  tgtgtgtgtg
1021  tgtctctctc  tctctctctc  ctccccctcc  actccctctt  cctcctgcct  ccacctctcc
1081  aggccccctg  cttgtccctc  cgtccggcct  ttctctgcct  ttccgtcctc  ctgctccccc
1141  atctctctct  gctagtctct  gtccagccgg  acccccacc  acagtccggc  cccagcgctt
1201  gagcctgagt  gtctgtctcc  gcccgaggag  gtggaggagg  gggagcgcaa  tgacctcacc
1261  agccccctct  cgaccacccc  cccctttccc  ttttcaactt  ttccaacttt  tccctccgtg
1321  ccctcctccg  agcgcgccgg  cgtgagccct  gcaaggcagc  cgctccgtct  gaatggaaaa
1381  ggcaggcagg  gaggtgagt  caggatgtgt  caggccggcc  tcccctgcgg  cctgcccccc
1441  gcccgcggcg  cccagcccc  tatataaccc  cccaggcgct  cacactccct  cactgccggg
1501  gccctgtctc  tcagggcaca  tgccctccct  ccccaggccg  cggcccagct  gaccctcggg
1561  gctcccccg  cagcggacag  ggaagggtta  aaggccccc  gctccctgcc  cctgcctctg
1621  gggaaccct  ggccctgtgg  ggacatgaac  tgtaagttgg  ttcatgggga  ggggtgaggg
1681  gacagggagg  cagggaggag  agggaccac  ggcgggggg  ggagcagacc  ccgctgagtc
1741  gcacagagag  ggaccggag  acaggcagcc  ggggaggaga  gcagcttcgg  agacaggagg
1801  cggcgaggga  gatgggcaga  gagagacaca  gacaggagcg  gatggaggca  gccaatcaga
1861  ggcgcggcag  gagggacggg  ccagacaggg  ccccgagagg  gagcgagaag  cggagaccga
1921  gcaggggag  ggacgcagg  actggtgcc  ggaggagggt  gacccccatc  gaccaggcc
1981  ccagggagcc  cgcggggacc  gggagactcc  ctgggattcc  ggccagagg  cctcgagggg
2041  aaactgaggc  agggctccgg  gagagcggag  caagccagg  agtagagacc  ccagccgggg
2101  ggaggagaga  gactgggcgc  ggggggaaag  cggggagagc  cgggcagatg  cggccgacgg
2161  aggcgcggac  agaccgacgg  ctggcgggcc  cggggggcgg  gctgggggtg  tgcgaggcgc
2221  gggcgggccg  ggagcgctga  ttggtggcg  ggtggccggg  tgggcggggc  ggcgggggtg
2281  ggctgcgggg  agcgagctcc  ggacccccgc  gccccccg  ccccccgcg  ccccccgcg
2341  cagctctccc  gctcccgcgg  cccggccggg  cccatggctc  tgcccctctc  cgcccagggtg
2401  cgctgcggcc  cgggcttctg  ccgccacccc  ggcggggctc  ctgggagggc  gtctaagggg
2461  tctcccgtgg  gagaggctcg  tgtctcccgg  gctccgtcct  ggcttctggc  tccctccccc
2521  gctcccagcc  agctcgggct  cccgcggccc  ggggaggggg  caggttctgg  cctgtgcctc
2581  ccccaccatg  ccccgccccg  gggccagat  tccggcgctc  gggggcgagc  gggagacgcc
2641  cggcccgtct  acccgccccg  ggccgcgtct  gctccgacgg  gcggggcagc  cagagccagg
2701  gagggagagg  gaagcccgcc  tggccctgcg  acctgcccgc  gggcggtcca  cctctggact
2761  taagacctcc  agctccatcc  tccctaagge  cgggagttca  ggccccagac  cctccccc
2821  gagaccagg  agtccagacc  ccaggtcttc  ctccctcaga  cctaggagtc  caggccccc
2881  gcctctctc  cctcagaccc  aggaggagtc  cagaccccag  ttccctctcc  ctcagacccg
2941  ggagtccagg  cccaggccct  cctctctcag  acccgagtc  cagcctgagc  tctctgctt
3001  atcctgcccc  cagggtgttg  ccgcctggtc  ctggtcgtgc  tgagcctgtg  gccagataca
3061  gctgtgcgcc  ctgggcccac  acctggcccc  cctcgagttt  cccagacccc  tccggccggg
3121  ctggacagca  ccgtgctcct  gaccgctct  ctccctggcg  acacgcggca  gctggctgca
3181  cagctggtag  gagagactgg  gctggggcca  gcacaggagt  gagaggcaga  gaggaacgga

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FIGURE 17

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3241 gaggagtctg cgggcagcca cttggagggg ttctgggctc tcaggtggca gaggtaggga
 3301 ggggaagagt tgggggcctg gcgtggggga tggagggagc cccgaggctg ggcaggggccc
 3361 acctcacagc ttttttccct gccagaggga caaattccca gctgacgggg accacaacct
 3421 ggattccctg cccaccctgg ccatgagtgc gggggcactg ggagctctac aggttaagggc
 3481 aagggagtg gctggggaca aggtgggagg caggcagtga agggggcggg gaggatgagg
 3541 ggcactggtc ggggtgtctc tgatgtccc gctctatccc cagctcccag gtgtgctgac
 3601 aaggctgcga gcggacctac tgtcctacct gcggcacgtg cagtggctgc gccgggcagg
 3661 tggctottcc ctgaagaccc tggagcccga gctgggcacc ctgcaggccc gactggaccg
 3721 gctgctgcgc cggtgcagc tcctgggatg tcctggcccc aagacctgac accccagacc
 3781 cccaccctg gccccaaaat cctgtggcct gagtccctga agcctgagac ccagatcccc
 3841 agtgcaacag ccccgctctg agacctgac accctaacag cccgctctga gacctgaca
 3901 ccgtaacagc cccgctctga gacctgacc ctaacagtcc tgctctgaga ccctgacct
 3961 gcagtcccaa gatcctgtgg ccctgagacc ctgaggccct agaccccaa atcctgcccc
 4021 gaaacttcaa attctcacc aagaccctga gactccatca tccatgacct caaagtcccc
 4081 agatcccagc ccctaagacc caagacccca tcctgaagcc caaagccttg agaattcaaa
 4141 tcctcacctc aagacttggg gacctggcc ccatgacatt gaaaaccatg gacctggcca
 4201 ggcgtgggtg ctcacgcctg taatccagc actttgggag gccgaggcaa gtggatcacc
 4261 tgaggtcggg agttcaagac cagccagacc aacatggtga aacctgtct ctactaaaa
 4321 tacaaaatta gccaggcgtg gtggtgcatg cctgtaatcc cagctacttg ggaggtgag
 4381 gcaggagaat cgcttgaacc tgggaggcgg aggttgagc gagccgagat cgcaccatta
 4441 cactccagcc tgggcaacaa gagcaaaact ccctctctct caaaaaaaa aaaaaaaaaa
 4501 aaaagaagga aaagaaaacc atggacctcc agacctgag accccaggcc ccagccctga
 4561 gatctgaca tcttaaatg cccaggccct aagatacaag accttgacct aaagccagcc
 4621 ttgggacctt ggctgtacaa acccaagacc tccaggacct agaccccgag ccctgaggcc
 4681 ctatgtctca ctcccaacat cgaaaacct gacacctcag atcctgagcc tgcgcctgta
 4741 cgactccaag accctcactt ccaaagccag gcccaaagcc ctgagaccag aagacttcaa
 4801 accctggttc ttgggcctaa ctccaaagac cctggatctc aaattccaac ttctagctct
 4861 gagactccag ccctcaccca tgagttcctg aacttgaacc cagagacccc atctctaaga
 4921 cttcagcctt gagatccagg gcctgacct agactcgag ccacagacct cagattactg
 4981 ctgtaaaacc ccagctctgg tggggagcag tggctcactc ctgtaatccc aaggcagggg
 5041 aggccaaggc agaaggacct cttgaggcca tgagtttgag acagcctggg cagcatagca
 5101 agactctgtt tcttaattat tattattatt attatttttt ggagacagag tctcgcgctc
 5161 tgttgcccag gctagagtgc aatggtgcca ttctggcttg ctggaacctc cgcctcctgg
 5221 gctcaagcga ttctcctgcc tcagcctcct gagtagctgg gacttcagggt gcacactgcc
 5281 acaccggat aatttttttg tatttttagta gacacagggg ttccacctgt tgcccaggct
 5341 ggtcacaaac tcctgagctc agggcatccg cccgcctogg cctcccaaag cctgggata
 5401 acaggcgtga tcccgcgcc ctggcttctt aattgttota acagcagcca caacaacaaa
 5461 aaccagctc tgagattcca gccccggcga ctctaacagt cccaggcccc atccctcacc
 5521 tagaaccgag atgccagccc tgactccaca gacttcaccc ccaaccccca cactcagctc
 5581 tggaagcccg tcctgactcc agcctccatt ttccggaaccc cacagcctga agagctcccg
 5641 gctaaacac ttcacccac gcgccacagt cccctgtga atatgcagcc ccgattcagc
 5701 tgcagctcca cagcaccct gcctgcacc cccgtgcac cccctacctg tgactacct
 5761 ctctcctctc cccacagatg tcccgctgg ccctgcccc caacccccg gaccgcggg
 5821 cgcctccgct ggcgcctccc tcctcagcct gggggggcat cagggcggcc cagccatcc
 5881 tgggggggct gnnnnctgaca cttnnnnctggg ccgtgagggg actgctgctg ctgaagactc
 5941 ggctgtgacc cggggcccaa agccaccacc gtccttccaa agccagatct tatttattta
 6001 tttatttcag tactgggggc gaaacagcca ggtgatcccc ccgccattat cccccctag
 6061 ttagagacag tccttccgtg aggcctgggg ggcactctgt ccttatttat cagtatttat
 6121 ttcaggagca ggggtgggag gcagggtggc tcctgggtcc ccgagggaga ggggactggg
 6181 tccccgatt cttgggtctc caagaagtct gtccacagac ttctgacctg gctcttcccc
 6241 atctaggcct gggcaggaac atatatattt tatttaagca attacttttc atgttggggg
 6301 ggggacggag gggaaaggga agcctgggtt ttgtacaaa aatgtgagaa acctttgtga
 6361 gacagagaac aggggaattaa atgtgtcata catatccact tgagggcgat ttgtctgaga
 6421 gctggggctg gatgcttggg taactggggc agggcaggtg gaggggagac ctccattcag
 6481 gtggaggtcc cgagtgggag gggcagcgac tgggagatgg gtcggtcacc cagacagctc
 6541 tgtggaggca gggctctgag cttgcctggg gccccgact gcatagggcc gtttgtttgt

FIGURE 17

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6601 tttttgagat ggagtctcgc tctgttgccct aggetggagt gcagtgaggg aatctaaggt
6661 cactgcaacc tccacctccc ggggttcaagc aattctcctg cctcagcctc ccgattagct
6721 gggatcacag gtgtgcacca ccatgcccag ctaattattt atttcttttg tatttttagt
6781 agagacaggg tttcaccatg ttggccaggc tggtttcgaa otctgacct cagggtgatcc
6841 tcctgcctcg gcctcccaaa gtgctgggat tacagggtgtg agccaccaca cctgacctat
6901 aggtcttcaa taaatattta atggaagggt ccacaagtca ccctgtgatc aacagtaccc
6961 gtatgggaca aagctgcaag gtcaagatgg ttcatatagg ctgtgttcac catagcaaac
7021 tggaacaat ctagatatcc aacagtgagg gttaagcaac atggtgcac tgtggataga
7081 acgccacca gccgccgga gcagggactg tcattcaggg aggctaagga gagaggcttg
7141 cttgggatat agaaagatat cctgacattg gccaggcatg gtggctcacg cctgtaatcc
7201 tggcactttg ggaggacgaa gcgagtggat cactgaagtc caagagtttg agaccggcct
7261 gcgagacatg gcaaaaccct gtctcaaaaa agaaagaatg atgtcctgac atgaaacagc
7321 aggtacaaa accactgcat gctgtgatcc caattttgtg ttttctttc tatatatgga
7381 ttaaaacaaa aatcctaaag ggaaatacgc caaatgttg acaatgactg tctccaggtc
7441 aaaggagaga ggtgggattg tgggtgactt ttaatgtgta tgattgtctg tattttacag
7501 aatttctgcc atgactgtgt attttgcatt acacatttta aaaataataa acactatttt
7561 tagaataaca gaatatcagc ctctctctct ccaaaaataa gccctcagga ggggacaaaag
7621 ttgaccgtg attgagcctg tcagggtgtg gcactaagtg tgggcttttt acttacacaa
7681 tcctcctgga ctcttgaata cgccctgttt tacaggcgag ggaaactgag tctcagacaa
7741 ggagtgggga ctctgttgca caaagtcaca cagctaggga gaggtggaag tgggattctg
7801 cgccgtgtct ggtcttttcc caaagctctc tttgcaagtc ggtgttgagg aatcctcgcc
7861 acatgcacac acatgagata tggagaaaca ggttcagtaa ggattgggtt cttaccagg
7921 gcctagagaa gggctaatgg cagagtagg atgataattc aaatgcttta gttacttttc
7981 cctttacaat aaccagaca gacttcagg ggcccgtgt cgtcactagt ttgagtctgg
8041 ggttgagggt gccatcctg ggcccgaggt tttgattcac ccatcatagc cctcaagact
8101 ccaggctggc tgggcgcggt ggctcacgcc tgtaatcca gcactttggg aggtgagggc
8161 ggtggatca cttgagggtc ggagttcaag gccagcctga ccaacatgga gaaaccctgt
8221 ctctactaaa aatacaatcc agctactcgg aaggctgagg caggagaatc gctcgaacct
8281 aggagacggg ggttgccgtg agccgagatc acatcacaaa cagccctagg cagtgcgggg
8341 cccagggcga ggctcagacc tgccctcaca gagctgtctg ggtgatcgtg cctcctcgt
8401 ggaggcaggg tttgagcctc ccctgggggc ccgcactgc taaggctgtt tgtttttgcg
8461 atggagtctc gctctgttgc ctaggctgga gtgcagtgtg gcaatctaag ctactgcct
8521 gggcaacaag agtgaaattc catctcaaaa aacaaaaaac aaacaaaca acaaaaaact
8581 ccaggctgta tccctggagg agaagggagc ccacagtccc cggagagttc ctggaagagg
8641 cccctgtgtg tccgatgagg tcacaaagcc cctccaaccag aggtcctcc cccagacccc
8701 tgctgtccac cctggcaggg ccatggcgga ggcccagtc tcccagcctg gggcatctcc
8761 acgctctgta acgctgagct ccaggcaccc gtgaagcccc acgggtcaag gctgggtggc
8821 cggggctggg aggcctgcac gcctgggttc tgggtcccta aaccagtacc catccaaccac
8881 agccaccatg atctggcttc gaaacaggag gtgccttgag ccgctccagg gcaccccgaa
8941 gtgggtccct gttctggggg agctgcaaaa gaccctccag aagggcgagt acctgcccct
9001 ccgtccgctg ccatgttctg agagtaactt tgttcagggtc tccagttccc agtgcccgg
9061 ggctgagagg gacagagggg aagcaaggcc ccccggtgtg ggggatcttg agagggaacg
9121 ggatttagca gtcactgtgt gggggacgat caggagggag gctcaggctg tggctgctgg
9181 aggaaggagt ggtcccagcc cctctccct ggctgcccc aagtgacccat caagggggcc
9241 cagtgttctg gaatcacaga accaaccggc tggccatggg cgtggccgcc tccctgccag
9301 gcctggtgtt gcctgacatc ttgctgatcg gccagcccgc cgaggacagg gactgctccg
9361 gcctcgtgct gaccaggtgc cgcaccccc aacccctcgg ccgccccctc caccctcct
9421 gctctagacg ctccctctc cctctcccag gatgatcccc ctggacctcg tccacctctg
9481 cgtccatgac ctctctgcct ggcgcctgaa gctgcgcctg gtctcgggcc gccagtacta
9541 cctggccctg gacgcccctg acaacgaggt gggcttctctg ttccactgct ggggtccgct
9601 catcaacctg cttcaggagc cggctccac ctggaccccc aggaccacgc gcacggcccc
9661 cctggatatg ccgctggcca aagcgcctgc ctccacctgg cacctgcagg tgggatccca
9721 gctccacaga ccagggtcat gcaggcccca ggaaccctcc ggccagatcc agaggggact
9781 cgaccaagag cccaaagtct agg

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wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.**FIGURE 17**

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mRNA of IL-11 mutein deriving from human IL-11 -SEQ ID NO:75-:

gaa ggg uua aag gcc ccc ggc ucc cug ccc ccu gcc cug ggg aac ccc ugg ccc ugu ggg gac aug
 aac ugu guu ugc cgc cug guc cug guc gug cug agc cug ugg cca gau aca gcu guc gcc ccu ggg
 cca cca ccu ggc ccc ccu cga guu ucc cca gac ccu cgg gcc gag cug gac agc acc gug cuc cug acc
 cgc ucu cuc cug gcg gac acg cgg cag cug gcu gca cag cug agg gac aaa uuc cca gcu gac ggg
 gac cac aac cug gau ucc cug ccc acc cug gcc aug agu gcg ggg gca cug gga gcu cua cag cuc
 cca ggu gug cug aca agg cug cga gcg gac cua cug ucc uac cug cgg cac gug cag ugg cug cgc
 cgg gca ggu ggc ucu ucc cug aag acc cug gag ccc gag cug ggc acc cug cag gcc cga cug gac
 cgg cug cug cgc cgg cug cag cuc cug aug ucc cgc cug gcc cug ccc cag cca ccc ccg gac ccg ccg
 gcg ccc ccg cug gcg ccc ccc ucc uca gcc ugg ggg ggc auc agg gcc gcc cac gcc auc cug ggg
 ggg cug n₁n₂n₃ cug aca cuu n₄n₅n₆ ugg gcc gug agg gga cug cug cug cug aag acu cgg cug uga
 ccc ggg gcc caa agc cac cac cgu ccu ucc aaa gcc aga ucu uau uua uuu auu uau uuc agu acu
 ggg ggc gaa aca gcc agg uga ucc ccc cgc cau uau cuc ccc cua guu aga gac agu ccu ucc gug
 agg ccu ggg ggg cau cug ugc cuu auu uau acu uau uua uuu cag gag cag ggg ugg gag gca ggu
 gga cuc cug ggu ccc cga gga gga ggg gac ugg ggu ccc gga uuc uug ggu cuc caa gaa guc ugu
 cca cag acu ucu gcc cug gcu cuu ccc cau cua ggc cug ggc agg aac aua uau uau uua uuu aag
 caa uua cuu uuc aug uug ggg ugg gga cgg agg gga aag gga agc cug ggu uuu ugu aca aaa aug
 uga gaa acc uuu gug aga cag aga aca ggg aaU uaa aug ugu cau aca uau cca cuu gag ggc gau
 uug ucu gag agc ugg ggc ugg aug cuu ggg uaa cug ggg cag ggc agg ugg agg gga gac cuc cau
 uca ggu gga ggu ccc gag ugg gcg ggg cag cga cug gga gau ggg ucg guc acc cag aca gcu cug
 ugg agg cag ggu cug agc cuu gcc ugg ggc ccc gca cug cau agg gcc guu ugu uug uuu uuu gag
 aug gag ucu cgc ucu guu gcc uag gcu gga gug cag uga ggc aaU cua agg uca cug caa ccu cca
 ccu ccc ggg uuc aag caa uuc ucc ugc cuc agc cuc ccg auu agc ugg gau cac agg ugu gca cca
 cca ugc cca gcu aaU uau uua uuu cuu uug uau uuu uag uag aga cag ggu uuc acc aug uug gcc
 agg cug guu ucg aac ucc uga ccu cag gug auc cuc cug ccu cgg ccu ccc aaa gug cug gga uua
 cag gug uga gcc acc aca ccu gac cca uag guc uuc aaU aaa uau uua aug gaa ggu ucc aca agu cac
 ccu gug auc aac agu acc cgu aug gga caa gcu gca agg uca aga ugg uuc auu aug gcu gug uuc
 acc aua gca aac ugg aaa caa ucu aga uau cca aca gug agg guu aag caa cau ggu gca ucu gug

FIGURE 18

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gau aga acg cca ccc agc cgc ccg gag cag gga cug uca uuc agg gag gcu aag gag aga ggc uug
 cuu ggg aua uag aaa gau auc cug aca uug gcc agg cau ggu ggc uca cgc cug uaa ucc ugg cac
 uuu ggg agg acg aag cga gug gau cac uga agu cca aga guu uga gac cgg ccu gcg aga cau ggc
 aaa acc cug ucu caa aaa aga aag aaU gau guc cug aca uga aac agc agg cua caa aac cac ugc aug
 cug uga ucc caa uuu ugu guu uuu cuu ucu aua uau gga uua aaa caa aaa ucc uaa agg gaa aua
 cgc caa aaU guu gac aaU gac ugu cuc cag guc aaa gga gag agg ugg gau ugu ggg uga cuu uua
 aug ugu aug auu guc ugu auu uua cag aaU uuc ugc cau gac ugu gua uuu ugc aug aca cau uuu
 aaa aaU aaU aaa cac uau uuu uag aaU

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are both chosen among the group comprising the nucleotide codons which codes for a hydrophobic aminoacid, namely for Alanine (A), Valine (V), Leucine (L), Isoleucine (I), Phenylalanine (F), Methionine (M), Proline (P), Tryptophan (W).

$n_1n_2n_3$ and $n_4n_5n_6$ can be chosen among the group comprising the following nucleotide codons:

- GCU, GCC, GCA, GCG
- GUU, GUC, GUA, GUG,
- UUA, UUG, CUU, CUC, CUA, CUG,
- AUU, AUC, AUA,
- UUU, UUC,
- AUG,
- CCU, CCC, CCA, CCG,
- UGG.

FIGURE18

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Gene of IL-11 muteins deriving from human IL-11 – SEQ ID NO:76-:

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gaagggtta aaggccccc gctccctgcc cctgccttg
gggaaccctt ggccctgttg ggacatgaac tgaagtgttg ttcattggga ggggtggagg
gacagggagg cagggaggag agggaccac ggcggggttg ggagcagacc ccgctgagtc
gcacagagag ggacccggag acaggcagcc ggggaggaga gcagcttcgg agacaggagg
cggcgaggag gatgggcaga gagagacaca gacaggagcg gatggaggca gccaatcaga
ggcgccgcag gagggacggg ccagacaggg ccccgagagg gagcagagac cggagaccga
gcaggggacg ggacgcaggg actggtgccg ggaggagggt gacccccatc gaccagggcc
ccaggagacc cgcggggacc gggagactcc ctgggattcc ggcagagagg ctccggaggg
aaactgaggc aggggtccgcg gagagcggag caagccaggg agtagcagacc ccagccgggg
ggaggagaga gactgggcgc ggggggaaag cggggagagc cgggcagatg cggccgacgg
aggcgccgac agaccgacgg ctggcgggcc cggggggcgg gctgggggtg tgcgaggcgc
ggcgccgcag ggagcgctga ttggctggcg ggtggccggg tgggcggggc tggcggggtg
ggctgcgggg agcgagctcc ggaccccccg gcccccgcg ccccccgcg ccccccgcg
cagctctccc gctcccgcg cccggccggg cccatggctc tgccctctc cgccagggtg
cgctgcggcc cgggcttctg ccgccacc ccgggggctc ctgggagggc gtctaagggg
tctcccgttg gagaggctcg tgtctcccgg gctccgtcct ggcttctggc tcttccccct
gctcccagcc agctcgggct cccgcggccc ggggaggggg caggttcttg cctgtgcctc
ccccaccatg ccccgccccg gggcccagat tccggcgctc gggggcggac gggagaccgc
cggcccgctc acccgccccg ggccgcgtct gctccgacgg gcggggcagc cagagccagg
gagggagagg gaagcccgc tggccctgcg acctgcccgc gggcgttcca ccctgggact
taagacctcc agctccatcc tccctaaggc cgggagttca ggccccagac cctcctcccc
gagaccagg agtccagacc ccaggccttc ctccctcaga cctaggagtc caggccccca
gcctctcctc cctcagaccc agggaggatc cagaccccag ttcctcctcc ctccagaccg
ggagtccagg cccaggccct cctctctcag acccgagatc cagcctgagc tctctgcctt
atcctgcccc cagggtgttg ccgctgtgct ctggtcgtgc tgagcctgtg gccagatata
gctgtcgcgc ctgggcccac acctggcccc cctcgagttt ccccgacacc tcggggccgag
ctggacagca ccgtgctcct gaccgcctct ctctggcgcg acacgcggca gctggctgca
cagctggtag gagagactgg gctggggcca gcacaggagt gagaggcaga gaggaacgga
gaggagtctg cgggcagcca cttggagggg ttctgggctc tcagggtggc gagtgaggga
ggggaagagt tgggggcctg gcgtggggga tggagggagc cccgaggctg ggcaggggcc
acctcacagc ttttttccct gccagaggga caaattccca gctgacgggg accacaacct
ggattccctg cccacctgg ccatgagtgc gggggcactg ggagctctac aggttaaggg
aaggcgctgg gctggggaca aggtgggagg caggcagtga agggggcggg gaggtaggag
ggcactggtc ggggtgttct tgatgtcccg gctctatccc cagctcccag gtgtgctgac
aaggctgcca gcggacctac tgtcctacct gcggcacgtg cagtggctgc gccgggcagg
tggtcttccc ctgaagaccc tggagcccga gctgggcacc ctgcaggccc gactggaccg
gctgctgcgc cggctgcagc tcctgggtatg tcctggcccc aagacctgac accccagacc
cccaccctg gcccacaaat cctgtggcct gagtccctga agcctgagac cccagaccgg
agtgaacag cccgcctctg agaccctgac accctaacag cccgctctga gacctgaca
ccgtaacagc cccgctctga gacctgacc ctaacagtcc tgctctgaga cctgacct
gcagtcccaa gatcctgtgg cctgagacc ctgaggccct agacccccaa atcctgccc
gaaacttcaa attctcacc aagacctga gactccatca tccatgacct caaagtcccc
agatcccagc ccctaagacc caagacccca tcctgaagcc caaagccttg agaattcaaa
tcctcacctc aagacttgga gacctggcc ccatgacatt gaaaaccatg gacctggcca
ggcgtggtg ctcacgcctg taatcccagc actttgggag gccgaggcaa gtggatcacc
tgaggtcggg agttcaagac cagccagacc aacatgggtg aacctgtct ctactaaaa
tacaaaatta gccaggcggt gtggtgcatg cctgtaatcc cagctacttg ggaggctgag
gcaggagaat cgcttgaacc tgggaggcgg aggttgagct gagccgagat cgcaccatta
cactccagcc tgggcaacaa gagcaaaact ccctctctct caaaaaaaaa aaaaaaaaaa
aaaagaagga aaagaaaacc atggacctcc agaccctgag accccaggcc ccagccctga
gatcctgaca tcttaagat cccaggccct aagatacaag accttgacct aaagccagcc
ttgggacctt ggctgtacaa acccaagacc tccaggacct agaccccgag cctgagggcc
ctatgtctca ctcccaacat cgaaaaacct gacacctcag atcctgagcc tgcgctgta
cgactccaag acctcactt ccaaagccag gcccaaagcc ctgagaccag aagacttcaa
acctgggttc ttgggcctaa ctccaaagac cctggatctc aaattccaac ttctagctct
gagactccag cctcaccca tgagttcctg aacttgaacc cagagacccc atctctaaga
cttcagcctt gagatccagg gcctgacctt agactcagac ccacagacct cagatactgt

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FIGURE 19

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ctgtaaaacc ccagctctgg tggggagcag tgggtcactc ctgtaatccc aaggcagggg
aggccaaggc agaaggacct cttgaggcca tgagtttgag acagcctggg cagcatagca
agactctgtt tcttaattat tattattatt attatTTTTT ggagacagag tctcgcgtc
tggtgcccag gctagagtgc aatggtgcca tttcggcttg ctggaacctc cgcctcctgg
gctcaagcga ttctcctgcc tcagcctcct gagtagctgg gacttcaggt gcacactgcc
acaccgggat aatttttttg tatttttagta gacacagggg ttcaocgtgt tgcccaggct
ggtcacaaac tcctgagctc aggccatccg cccgcctcgg cctcccaaag cgctgggata
acaggcgtga tcccgcgcg cttggcttctt aattgttcta acagcagcca caacaacaaa
aaccagctc tgagattcca gccccggcga ctctaacagt cccaggcccc atccctcacc
tagaaccgag atgccagccc tgactccaca gacttcaccc ccaaccccc cactcagctc
tggaagcccg tcctgactcc agcctccatt ttcggaaccc cacagcctga agagctcccg
gcctaaacac tcacccacac gcgcacagt ccccctgtga atatgcagcc acctattcagc
tgacgctcca cagcaccctt gccctgcacc cccgctgcac cccctacctg tgactcacct
ctctcctctc cccacagatg tcccgctcgg ccctgcccc cccacccccg gaccgcggg
cgcccccgct ggcgcccccc tcctcagcct gggggggcat cagggccgcc cagccatcc
tgggggggct gn1n2n3ctgaca cttn4n5n6tggg ccgtgagggg actgctgctg ctgaagactc
ggctgtgacc cggggcccaa agccaccacc gtccctccaa agccagatct tatttattta
tttatttcag tactgggggc gaaacagcca ggtgatcccc ccgccattat cccccctag
ttagagacag tccttcctgt aggcctgggg ggcatctgtg ccttatttat ccttatttat
ttcaggagca ggggtgggag gcaggtggac tcctgggtcc ccgaggagga ggggactggg
gtcccggtatt cttgggtctc caagaagtct gtccacagac ttctgccctg gctcttcccc
atctaggcct gggcaggaac atatattatt tatttaagca attacttttc atgttggggt
ggggacggag gggaaaggga agcctgggtt tttgtacaaa aatgtgagaa acctttgtga
gacagagaac agggaaattaa atgtgtcata catatccact tgagggcgat ttgtctgaga
gctggggctg gatgcttggg taactggggc agggcaggtg gaggggagac ctccattcag
gtggagggtcc cgagtgggcg gggcagcgac tgggagatgg gtcggtcacc cagacagctc
tgtggaggca gggctctgagc cttgcctggg gccccgact gcataggggc gtttgtttgt
tttttgagat ggagtctcgc tctgttgctt aggctggagt gcagtgaggc aatctaaggt
cactgcaacc tccacctccc gggttcaagc aattctcctg cctcagcctc ccgattagct
gggatcacag gtgtgcacca ccatgccag ctaattattt atttcttttg tatttttagt
agagacaggg ttccaccatg ttggccagge tggtttcgaa ctccctgacct caggtgatcc
tcctgctctg gcctcccaaa gtgctgggat tacaggtgtg agccaccaca cctgacctat
aggctcttcaa taaatattta atggaaggtt ccacaagtca ccctgtgatc aacagtaccc
gtatgggaca aagctgcaag gtoaagatgg ttcattatgg ctgtgttcac catagcaaac
tggaacaat ctagatatcc aacagtgagg gtttaagcaac atgggtgcac tgtggataga
acgccacca gccgcccgga gcagggactg tcattcaggg aggctaagga gagaggcttg
cttgggatat agaaagatat cctgacattg gccaggcatg gtggctcacg cctgtaatcc
tggcactttg ggaggacgaa gcgagtggat cactgaagtc caagagtttg agaccggcct
gcgagacatg gcaaaaccct gtctcaaaaa agaaagaatg atgtcctgac atgaaacagc
aggctacaaa accactgcat gctgtgatcc caattttgtg tttttcttcc tatatatgga
ttaaaacaaa aatcctaaag ggaaatacgc caaatgttg acaatgactg tctccaggtc
aaaggagaga ggtgggattg tgggtgactt ttaatgtgta tgattgtctg tattttacag
aatttctgcc atgactgtgt attttgcagt acacatttta aaaataataa acactatttt
tagaat

```

wherein the codon $n_1n_2n_3$ and the codon $n_4n_5n_6$ are as defined in Figure 16A.

FIGURE 19

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Radioprotection of mice treated by FPAII-1 after irradiation at 15 Gy

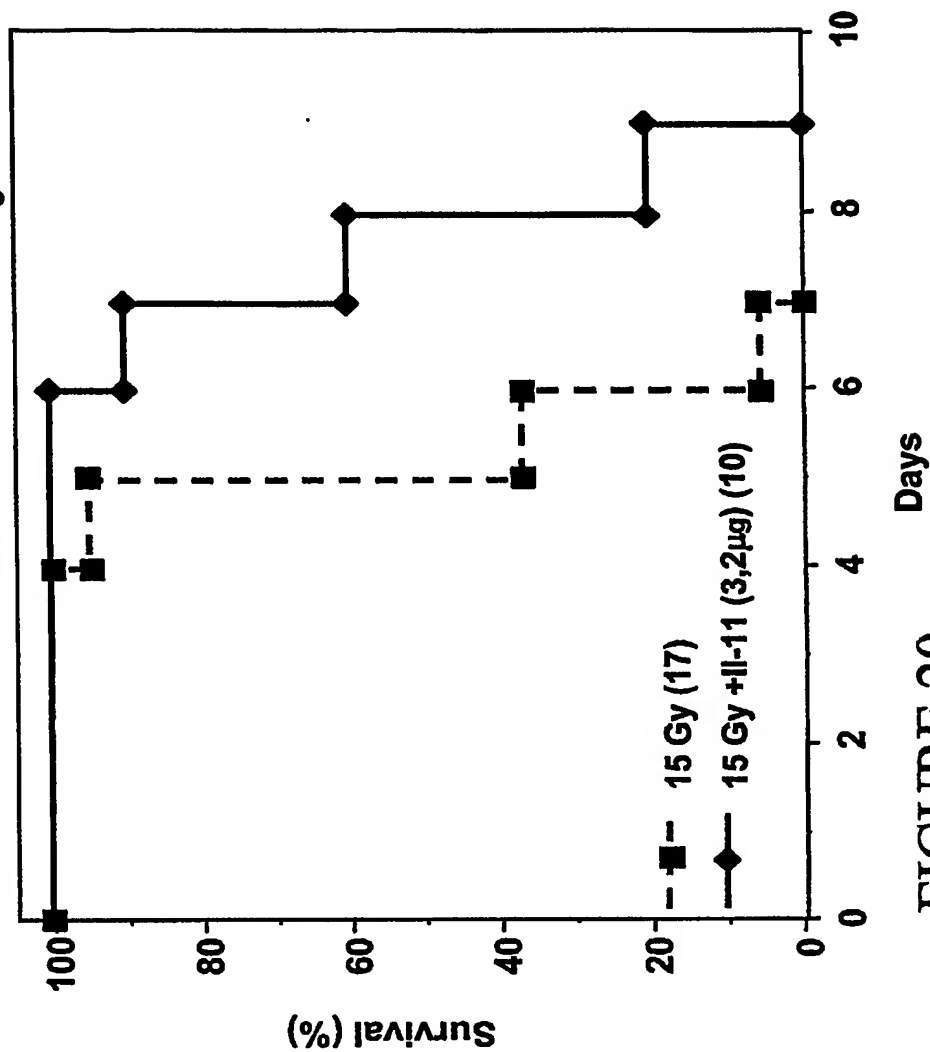


FIGURE 20

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Low doses of FPΔII-11 mutein delay the death mice irradiated at 15 Gy

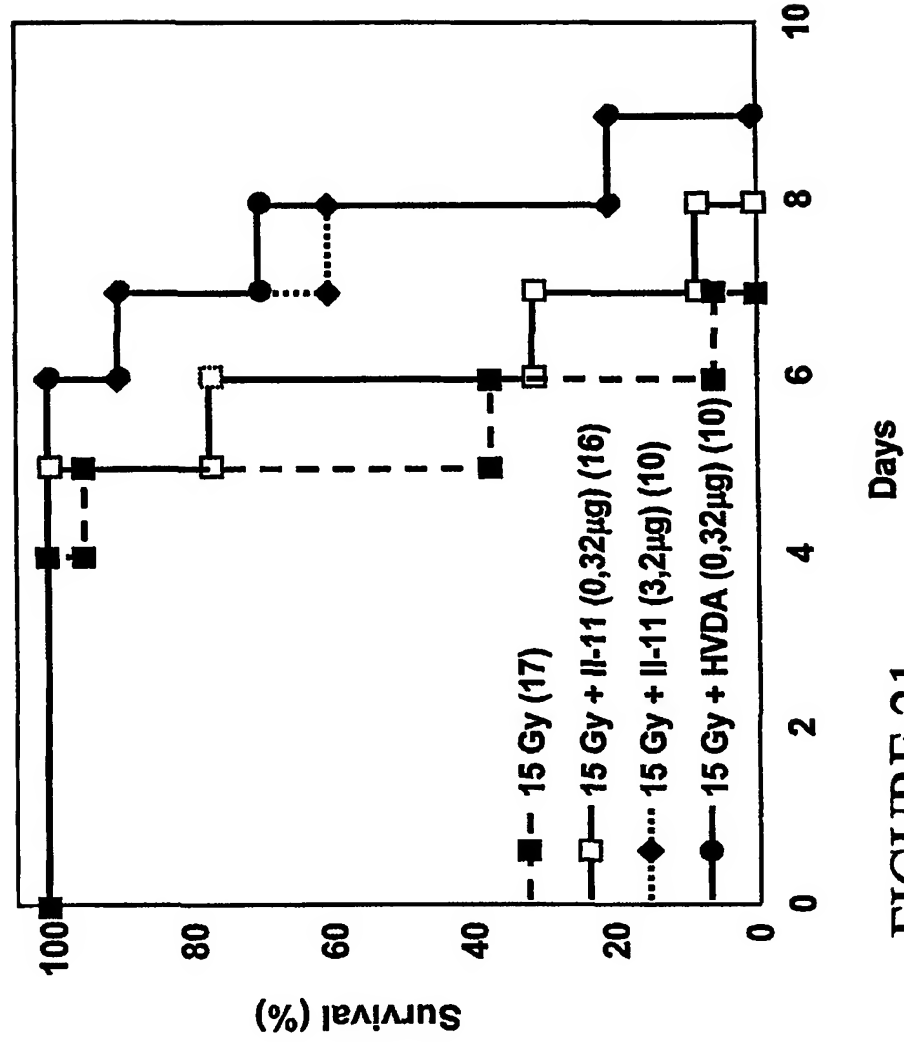


FIGURE 21

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Parental (non-mutated) nucleotide sequence FPAIL-11 = SEQ ID NO:77 =

ATG GAC TAC AAG GAT GAC GAT GAC AAG GAA GGT CGT CGT GCA TCT
GTT GCA TCC CCA GAC CCT CGG GCC GAG CTG GAC AGC ACC GTG CTC
CTG ACC CGC TCT CTC CTG GCG GAC ACG CGG CAG CTG GCT GCA CAG
CTG AGG GAC AAA TTC CCA GCT GAC GGG GAC CAC AAC CTG GAT TCC
CTG CCC ACC CTG GCC ATG AGT GCG GGG GCA CTG GGA GCT CTA CAG
CTC CCA GGT GTG CTG ACA AGG CTG CGA GCG GAC CTA CTG TCC TAC
CTG CGG CAC GTG CAG TGG CTG CGC CGG GCA GGT GGC TCT TCC CTG
AAG ACC CTG GAG CCC GAG CTG GGC ACC CTG CAG GCC CGA CTG GAC
CGG CTG CTG CGC CGG CTG CAG CTC CTG ATG TCC CGC CTG GCC CTG
CCC CAG CCA CCC CCG GAC CCG CCG GCG CCC CCG CTG GCG CCC CCC
TCC TCA GCC TGG GGG GGC ATC AGG GCC GCC CAC GCC ATC CTG GGG
GGG CTG CAC CTG ACA CTT GAC TGG GCC GTG AGG GGA CTG CTG CTG
CTG AAG ACT CGG CTG TGA

Parental (non-mutated) amino acid sequence of FPAIL-11 = SEQ ID NO:78 =

MDYKDDDDKEGRRASVASPDPRAEIDSTVLLTRSLLADTRQLAAQLRDKFPA
DGDHNLDSLPTLAMSAGALQLPGVLTRLRADLLSYLRHVQWLRRAAGSS
LKTLEPELGTLQARLDRLRLQLLMSRLALPQPPDPPAPPLAPPSSAWGGIRA
AHAILGGLHLTLDWAVRGLLLLKTRL

FIGURE 22

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Mutated nucleotide sequence of FPAIL-11 = SEQ ID NO:79 of the invention =

ATG GAC TAC AAG GAT GAC GAT GAC AAG GAA GGT CGT CGT GCA TCT
GTT GCA TCC CCA GAC CCT CGG GCC GAG CTG GAC AGC ACC GTG CTC
CTG ACC CGC TCT CTC CTG GCG GAC ACG CGG CAG CTG GCT GCA CAG
CTG AGG GAC AAA TTC CCA GCT GAC GGG GAC CAC AAC CTG GAT TCC
CTG CCC ACC CTG GCC ATG AGT GCG GGG GCA CTG GGA GCT CTA CAG
CTC CCA GGT GTG CTG ACA AGG CTG CGA GCG GAC CTA CTG TCC TAC
CTG CGG CAC GTG CAG TGG CTG CGC CGG GCA GGT GGC TCT TCC CTG
AAG ACC CTG GAG CCC GAG CTG GGC ACC CTG CAG GCC CGA CTG GAC
CGG CTG CTG CGC CGG CTG CAG CTC CTG ATG TCC CGC CTG GCC CTG
CCC CAG CCA CCC CCG GAC CCG CCG GCG CCC CCG CTG GCG CCC CCC
TCC TCA GCC TGG GGG GGC ATC AGG GCC GCC CAC GCC ATC CTG GGG
GGG CTG GTT CTG ACA CTT GCC TGG GCC GTG AGG GGA CTG CTG CTG
CTG AAG ACT CGG CTG TGA

Mutated amino acid sequence of FPAIL-11 = SEQ ID NO:80 of the invention =

MDYKDDDDKEGRRASVASPDPRAE~~LD~~STVLLTRSL~~AD~~TRQLAAQLRDKFPA
DGDHNLD~~SL~~PTLAM~~S~~AGALGALQLPGVLTRLRADLLSYLRHVQWLRRAGGSS
LKTLEPELGTLQARLDRLRLRLQLMSRLALPQPPDPAPPLAPPSSAWGGIRA
AHAILGGLVLTLAWAVRGLLLLKTRL

FIGURE 23

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Primers used for inverse PCR mutagenesis of FPΔIL-11:

Muteins	Primers
H182/V	G422 pACACTTGACTGGGCCGTACGGGGAC (s) SEQ ID NO:81 G412 pCAGA <u>A</u> CCAGCCCCCCCAGGATGG (as) SEQ ID NO:82
D186/V	G410 pACACTTG <u>I</u> CTGGGCCGTACGGGGAC (s) SEQ ID NO:83 G421 pCAGGTGCAGCCCCCCCAGGATGG (as) SEQ ID NO:84
D186/A	G411 pACACTTG <u>C</u> CTGGGCCGTACGGGGAC (s) SEQ ID NO:85 G421 pCAGGTGCAGCCCCCCCAGGATGG (as) SEQ ID NO:86
H182/V- D186/V	G410 pACACTTG <u>I</u> CTGGGCCGTACGGGGAC (s) SEQ ID NO:87 G412 pCAGA <u>A</u> CCAGCCCCCCCAGGATGG (as) SEQ ID NO:88
H182/V- D186/A	G411 pACACTTG <u>C</u> CTGGGCCGTACGGGGAC (s) SEQ ID NO:89 G412 pCAGA <u>A</u> CCAGCCCCCCCAGGATGG (as) SEQ ID NO:90

FIGURE 24

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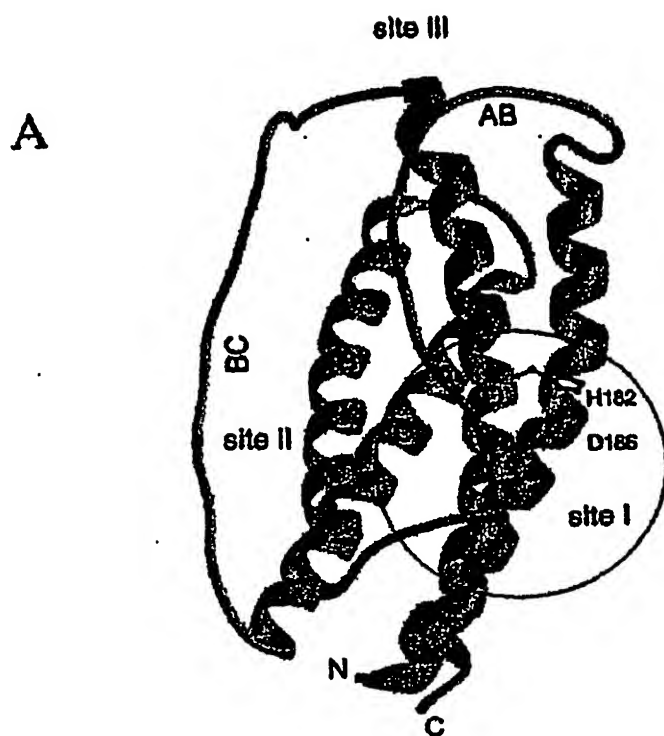


Figure 25A

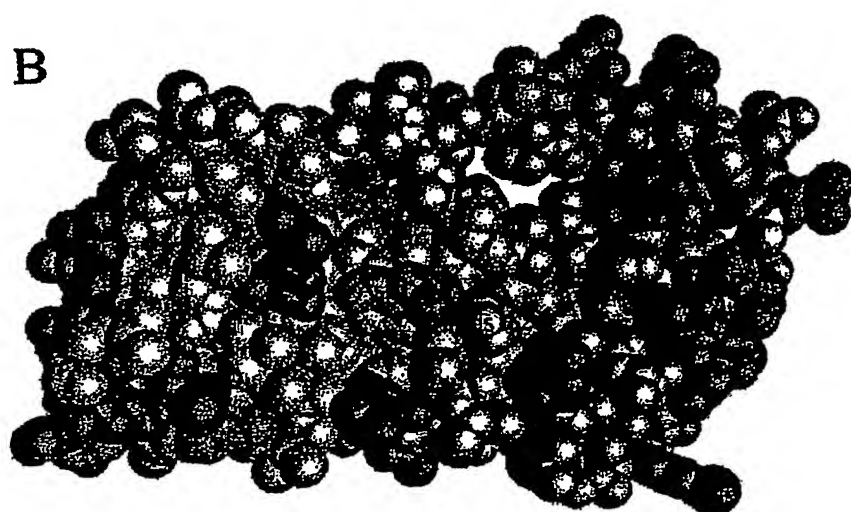


Figure 25B

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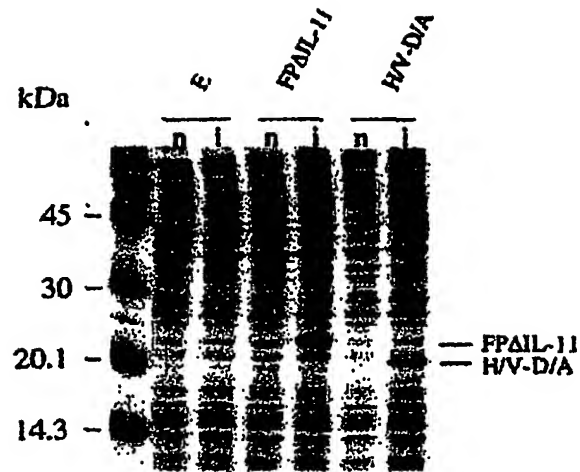


Figure 26

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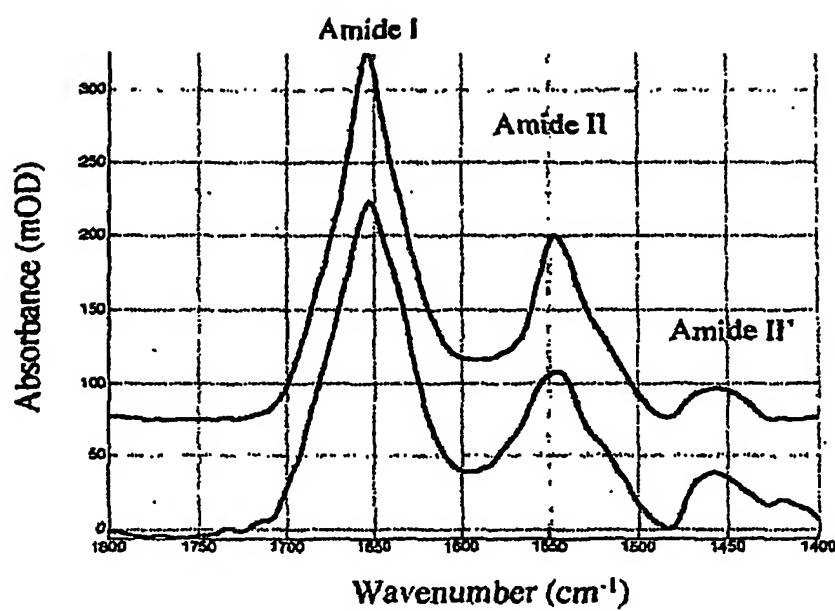


Figure 27

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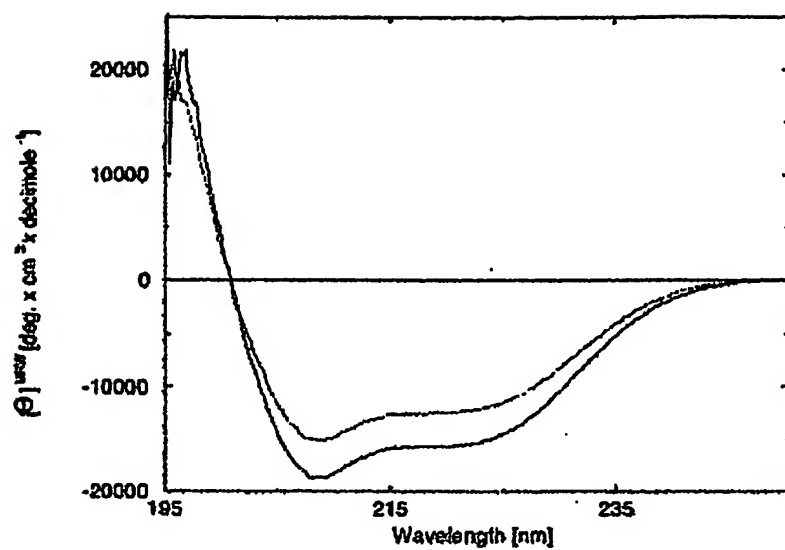


Figure 28

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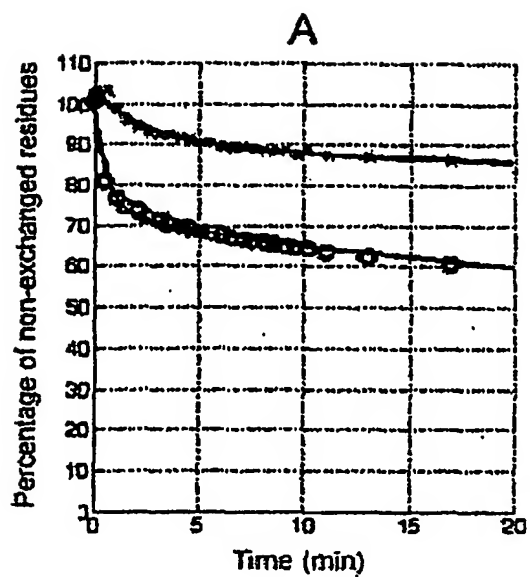


Figure 29A

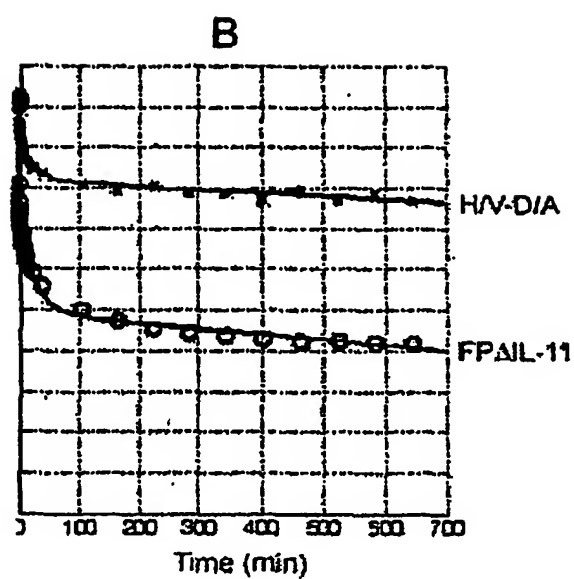
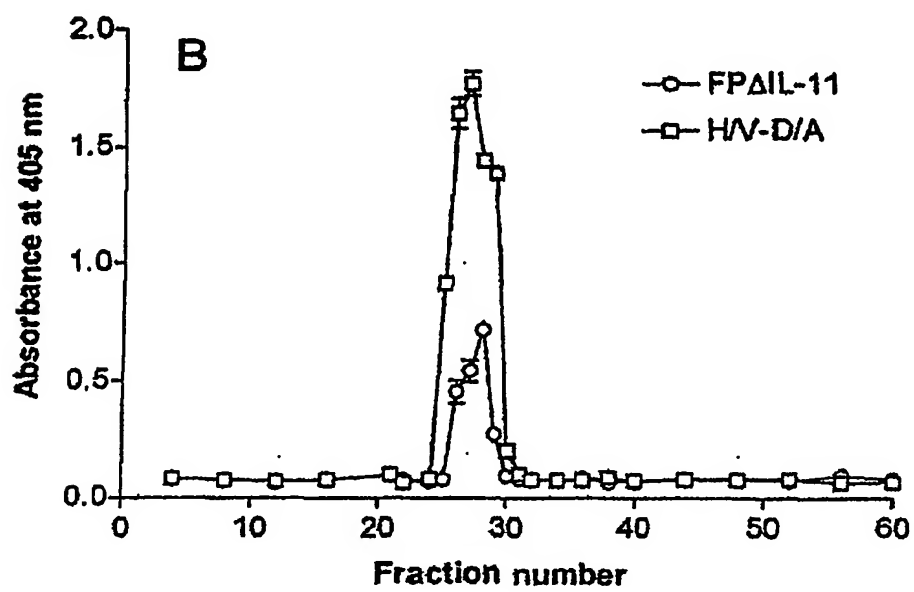
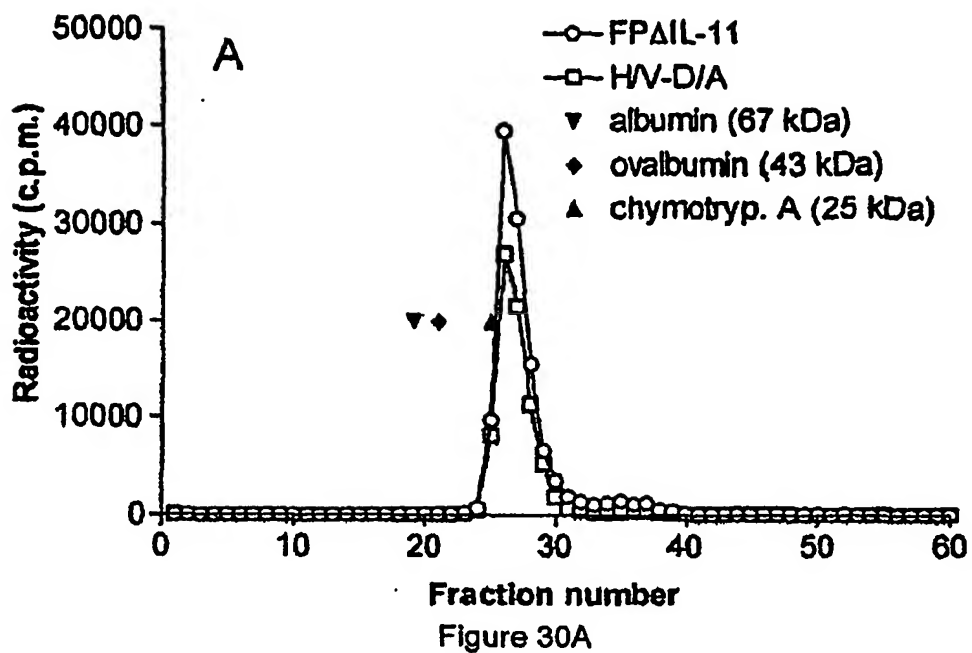
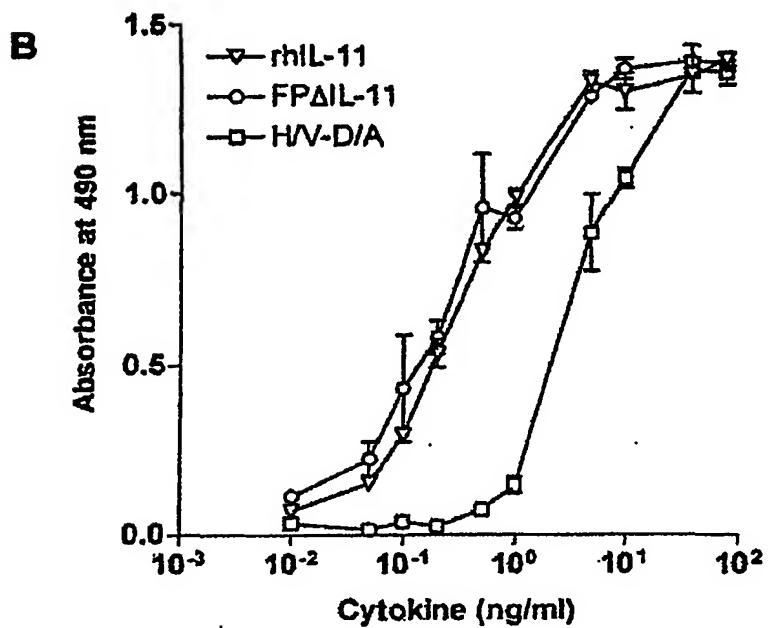
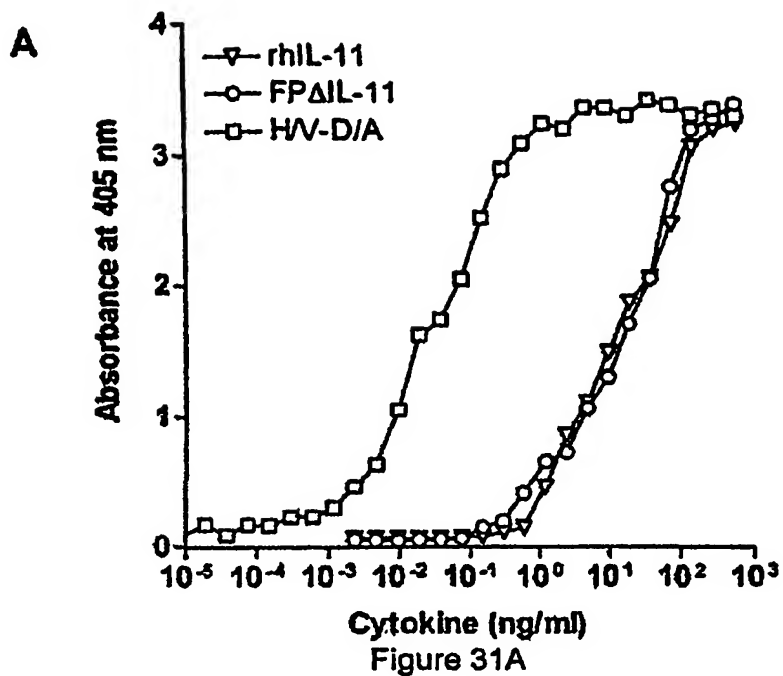


Figure 29B

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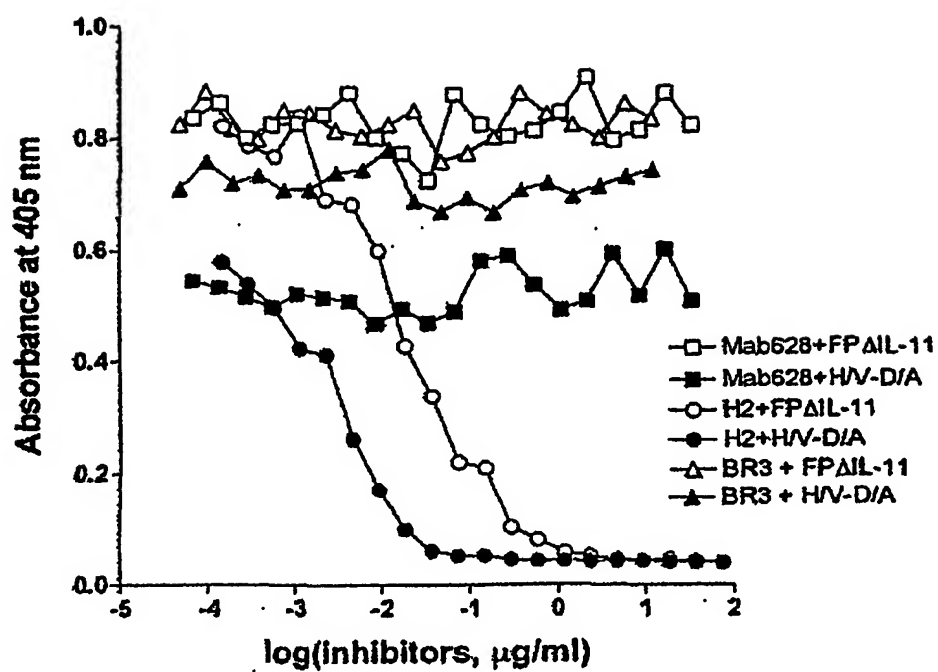


Figure 32

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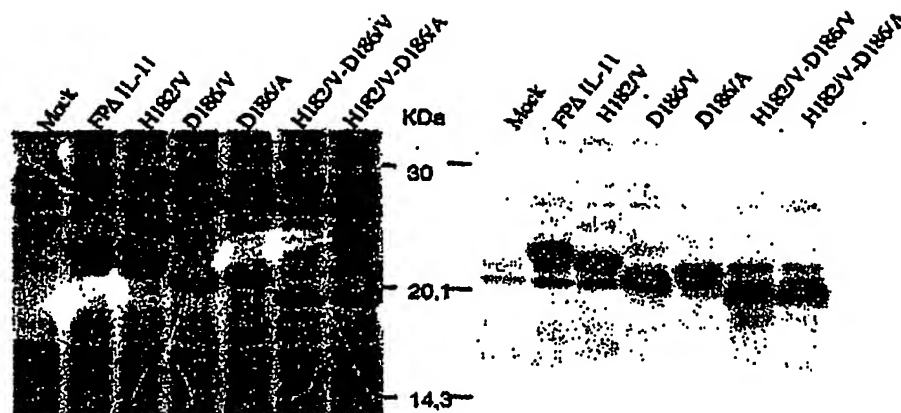


Figure 33

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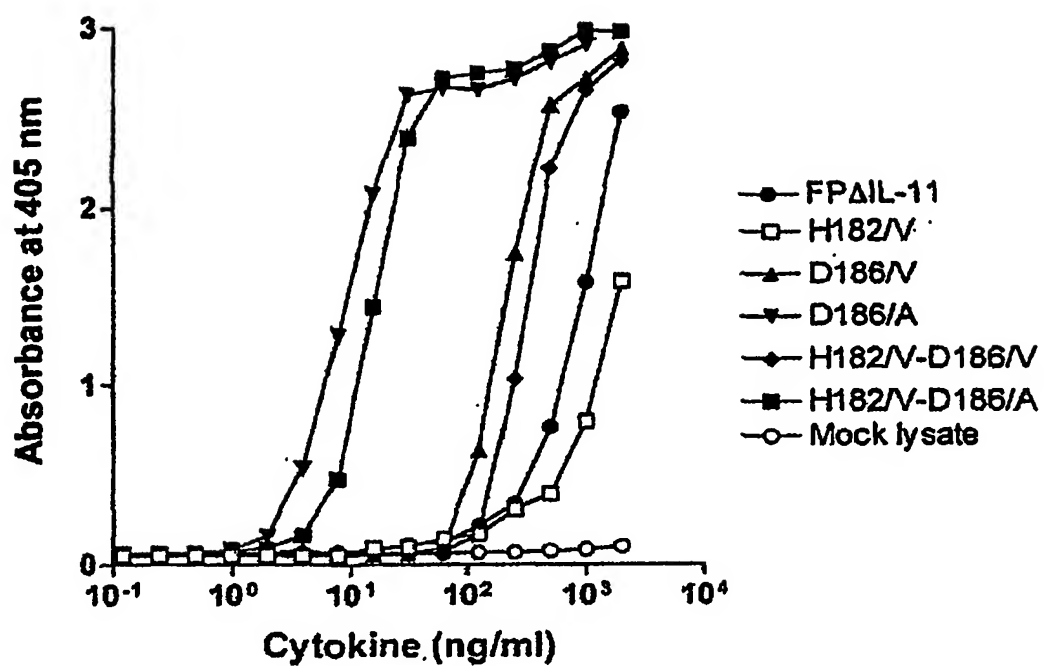
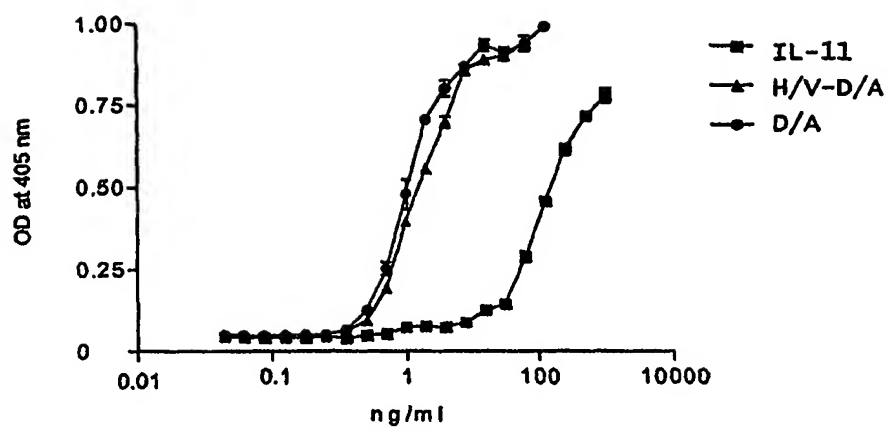
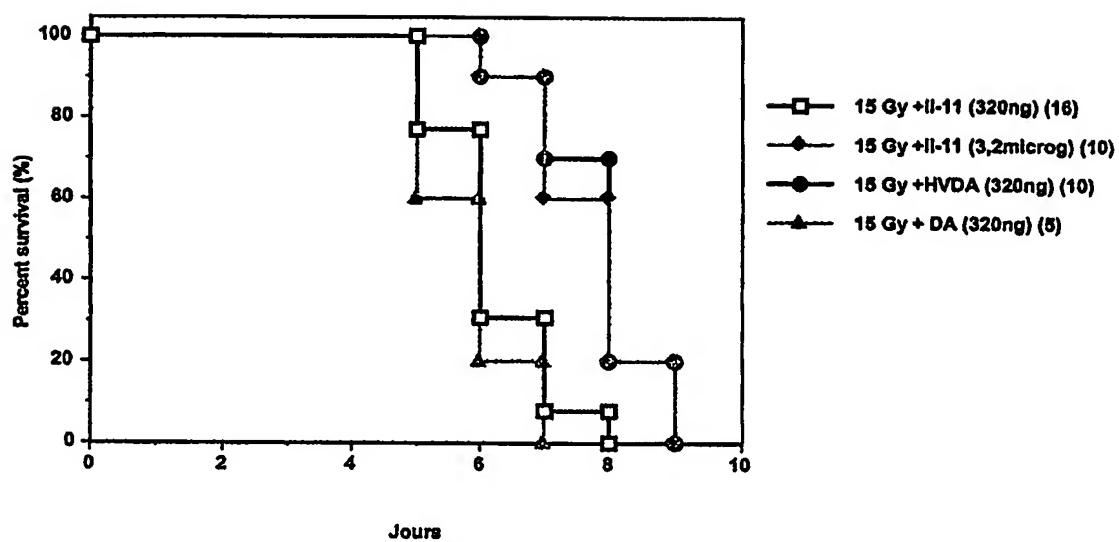


Figure 34

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**FIGURE 35**

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**FIGURE 36**